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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/825,839

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Lee Teck Kheng

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WELLS ST. JOHN P.S.  
601 W. FIRST AVENUE, SUITE 1300  
SPOKANE, WA 99201

EXAMINER

KALAM, ABUL

ART UNIT

PAPER NUMBER

2814

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/825,839	<b>Applicant(s)</b> KHENG, LEE TECK	
	<b>Examiner</b> ABUL KALAM	<b>Art Unit</b> 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 2-4, 7, 8 and 57-65 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 2-4, 7, 8 and 57-65 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Specification***

1. The title of the invention is still not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: A Semiconductor Package with an Interposer.

### ***Claim Rejections - 35 USC § 102***

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 4, 7, and 60 are rejected under 35 U.S.C. 102(b) as being anticipated by US 6,218,731 to Huang et al (hereinafter Huang).

Regarding claims 4 and 7, Huang discloses a semiconductor package in fig. 5, comprising

an interposer 160 construction containing only a single dielectric support member (164, 168, 172), col. 5 lines 25-30, and comprising a plurality copper conductive circuit traces (162, 174, 175), col. 5 lines 30-45, contacting the single dielectric support member (fig. 5),

a semiconductor die 116, col. 6 line 3, electrically connected with at least one of the traces 175, fig. 5;

at least one of the circuit traces 162, fig. 5, being between the semiconductor die 116 and the dielectric support member (164, 168, 172);

the dielectric support member (164, 168, 172) having a first surface and an opposing second surface (top surface of 164 and bottom surface of 172, fig. 5), the plurality of the circuit traces 174 being over the first surface, fig. 5, openings 112 extending through the second surface to at least some of the circuit traces 174 (col. 5 lines 59-57);

contact pads 108, col. 5 line 55, within one or more of the openings 112 and in electrical connection with one or more of the circuit traces 174, the contact pads 108 being entirely contained within the openings (fig. 5); wherein an entirety of at least one of the contact pads 108 is elevationally spaced from at least one of the first and the second surfaces of the dielectric support member (164, 168, 172, fig. 5); and

solder balls 128 in electrical connection with the contact pads 108 (fig. 5).

Regarding claim 60, Huang discloses the semiconductor package further comprises an adhesive structure 122, col. 6 line 1, directly contacting the plurality of the circuit traces 162, fig. 3, and directly contacting the semiconductor die 116, the adhesive structure comprising dielectric material (col. 6 lines 1-3). It is inherent that the adhesive 122 is a dielectric material because the die 116 is directly attached to the conductive circuit trace 102 via the adhesive (fig. 5), and in order to prevent electrical connection between the die substrate and the circuit traces, the adhesive must comprise an electrically insulating material.

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4. Claims 2, 3, 7, 8, 57-59, 61 and 65 are rejected under 35 U.S.C. 102(a) as being anticipated by Applicant Admitted Prior Art (AAPA).

Regarding claim 7, AAPA discloses a semiconductor package in fig. 1, comprising

an interposer 14 construction containing only a single dielectric support member (15 and 20), and comprising a plurality conductive circuit traces 17, contacting the single dielectric support member (15 and 20),

a semiconductor die 12 electrically connected with at least one of the traces 17; at least one of the circuit traces 17 being between the semiconductor die 12 and the dielectric support member (15 and 20);

the dielectric support member (15 and 20) having a first surface and an opposing second surface, fig. 1, the plurality of circuit traces 17 being over the first surface, fig. 1, openings (gaps between 20) extending through the second surface to at least some of the circuit traces 17;

contact pads 30 within one or more of the openings and in electrical connection with one or more of the circuit traces 17, the contact pads 30 being entirely contained within the openings, fig. 1, wherein an entirety of at least one of the contact pads is elevationally spaced from at least one of the first and the second surfaces of the of the dielectric support member (15 and 20); and

solder balls 36 in electrical connection with the contact pads 30.

Regarding claims 2-3, AAPA teaches the semiconductor package wherein the support member (15 and 20) is a photomask material (specification [0005]: "dry film photomask") or not a photo mask material (specification [0004]: "glass weave material").

Regarding claim 8, AAPA discloses the semiconductor package wherein the dielectric support member (15 and 20) has a slit 50 extending therethrough; and the electrical connection of the semiconductor die 12 to said at least one of the circuit traces 17 includes one or more wire bonds 44, extending from the die 12, through the slit, and into at least one of the openings (fig. 1).

Regarding claims 57-59, AAPA discloses the semiconductor package wherein the entirety of the at least one contact pad is elevationally spaced from both the first and the second surfaces of the dielectric support member.

Regarding claim 61, AAPA discloses the semiconductor package wherein the at least one contact pad comprises at least two conductive layers (32 and 34), fig. 1.

Regarding claim 65, AAPA discloses the semiconductor package further comprising an adhesive structure 16 directly contacting the single dielectric support member (15 and 20, fig. 1) and directly contacting the semiconductor die 12, the adhesive structure 16 comprising a dielectric material (specification [0004]: "cured glue, paste, or other polymeric matrix").

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 62-64 are rejected under 35 U.S.C. 103(a) as being unpatentable over Huang (US '731), as applied to claim 7 above, in view of US 2003/0230799 Yee et al. (hereinafter Yee).

Regarding claims 62 and 63, Huang teaches all the limitations of the claim with the exception of disclosing wherein the interposer has a thickness comprising a range from about 15  $\mu\text{m}$  to about 150  $\mu\text{m}$  (claim 62) and wherein the interposer has a thickness comprising about 50  $\mu\text{m}$  (claim 63).

However, Yee discloses a semiconductor package (Fig. 1) comprising an interposer 12 with a thickness in range from about 20  $\mu\text{m}$  to about 150  $\mu\text{m}$  (¶ [0047]). Note, where patentability is said to be based upon a particular chosen range or dimension recited in a claim, the Applicant must show that the chosen range or dimension is critical. *In re Woodruff*, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990). Furthermore, it is not inventive to discover optimum or workable ranges by routine experimentation. *In re Aller*, 220 F.2d 454, 105 USPQ 233, 234 (CCPA 1955).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to have a thickness of the interposer in such a range as claimed,

because the range is not critical since it can be optimized during routine experimentation, depending upon the desired size of the package.

Regarding claim 64, Huang discloses a single dielectric support member (164, 168, 172; col. 5 lines 25-30, col. 3 lines 45-456) comprising glass epoxy (FR-4, FR-5) or bismaleimide-triazine (BT). Thus, Huang teaches all the limitations of the claim with the exception of disclosing wherein the single dielectric support member comprises at least one of polyimide and liquid polymer crystal.

However, Yee discloses that a dielectric support member 12 used for an interposer may comprise polyimide film, liquid crystal polymer, bismaleimide-triazine (BT) or epoxy resins such FR-4, FR-5 (§ [0047]).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Yee into the structure of Huang, to form the dielectric support member with polyimide or liquid crystal polymer, because such a modification would have been considered a mere substitution of art recognized equivalent materials (MPEP 2144.06). Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Lindle Air Products Co.* 85 USPQ 328 (USSC 1950).

### ***Response to Arguments***

1. Applicant's arguments filed October 22, 2007, have been fully considered but they are not persuasive.



With respect to claim 7 and the Huang reference, Applicant argues that Huang does not positively teach contact pads entirely contained within the openings, wherein an entirety of at least one of the contact pads is elevationally spaced from at least one of the surfaces of the dielectric support member. The argument is not persuasive, because Fig. 5 of Huang clearly shows contact pads 108, which are entirely contained within openings 112, wherein at least one of the contact pads 108 (shorter ones connected to traces 175, Fig. 5) is elevationally spaced from at least one the surfaces of the dielectric support member (164, 168, 172).

With respect to claim 7 and Applicant's Admitted Prior Art (AAPA) in Fig. 1, Applicant argues:

"The AAPA interposer construction 14 represented by Fig. 1 of the present application explicitly states that the AAPA interposer construction 14 contains 'two dielectric support members (15 and 20)' (0040 of present application) and not 'only a dielectric support member' as positively recited by claim 7."

The argument is not persuasive because Fig. 1 clearly shows that the board 15 and the dielectric material 20 are attached to each other to form a single dielectric support member. Although the structures 15 and 20 are made of different materials, the structures combined can be interpreted as "a single dielectric support member" because they are both formed of dielectric material, provide support for the interposer construction, and are attached to each other to form a single support structure. Furthermore, note that the limitation of "a single dielectric support member" is defined by the claim language, which does not limit the structure to only one layer of material.

***Conclusion***

1. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ABUL KALAM whose telephone number is (571)272-8346. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M. Fahmy can be reached on 571-272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/A. K./  
Examiner, Art Unit 2814

/Phat X Cao/  
Primary Examiner, Art Unit 2814